Environmental Product Declaration

In accordance with ISO14025:2006 and EN15804+A2:2019

Reinforcing bar



Owner of the declaration:
Korea STEEL Co.,Ltd

Product name:
Reinforcing bar

Declared unit:
1 metric tonne of Reinforcing bar

Product category /PCR:
NPCR Part A for Construction products and services & NPCR 013 2021 Part B for Steel and Aluminium Construction Products (A2-2019 edit) 061021

Program holder and publisher:
The Norwegian EPD foundation

Declaration number:
NEPD-18606-22850

Registration number:
NEPD-18606-22850

Issue date:
16.10.2026

Valid to:
16.10.2031

General information

Product:
Reinforcing bar

Program operator:
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Declaration number:
NEPD-18606-22850

This declaration is based on Product Category Rules:
NPCR Part A for Construction products and services & NPCR 013 2021 Part B for Steel and Aluminium Construction Products (A2-2019 edit) 061021

Statement of liability:
The owner of the declaration shall be liable for the underlying information and evidence. EPD-Global shall not be liable with respect to manufacturer, life cycle assessment data and evidences.

Declared unit:
1 metric tonne of reinforcing bar

Declared unit with option:
Cradle to gate(A1-A3) with modules A4, C1-C4 and module D

Verification:
Independent verification of the declaration and data, according to ISO14025:2010

internal ☐ external ■

Sign

Noh-hyun Lim

Noh-hyun Lim
Independent verifier approved by EPD-Global

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Manufacturer:
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Place of production:
Korea STEEL Co.,Ltd
98, Gongdandong-gil, Chilseo-myeon
Haman-gun, Gyeongnam, Korea

Management system:
ISO 14001, ISO 45001 and ISO 9001

Organisation no:
606-81-01728

Issue date: 16.10.2026

Valid to: 16.10.2031

Year of study:
2025

Comparability:
EPD of construction products may not be able to compare if they do not comply with EN 15804 and are seen in a building context.

The EPD has been worked out by:
Soonchul Jung, GreenBridgeConsulting

Approved

Manager of EPD-Global

Product

Product description:

The declared product in this EPD is "Reinforcing steel bar – average product manufactured at Korea Steel Chilseo Plant," including standard rebar and seismic-resistant rebar. Each product is manufactured in various dimensions, with detailed technical specifications provided in Technical Information. The declared unit of 1 metric tonne of rebar represents an average product calculated by incorporating the annual production volume and the production ratio of each steel grade manufactured by STEEL Co.,Ltd.

The reinforcing steel included in the selection of representative products was classified by steel grade based on the applicable standards, yield strength, and other relevant specifications. Only steel grades with actual production records in the base year were considered.

Dimensions and Weight: According to KS standards, reinforcing bars are classified into grades ranging from SD300 to SD700S, and are manufactured in sizes ranging from D10 to D57 for each grade. Dimensions and weights, such as unit weight (kg/m), nominal diameter (mm), nominal cross-sectional area (mm^2), and nominal perimeter (mm), are specified for each nominal size. In addition, the permissible weight tolerance of an individual reinforcing bar according to the nominal size of each grade is set within a range of 4–6%.

Length: The length may be determined through consultation with the purchaser, and permissible length tolerances are specified depending on whether the length is 7 m or less or exceeds 7 m (7 m or less: up to +40 mm; exceeding 7 m: 5 mm is added to the permissible tolerance of +40 mm for each additional 1 m or fraction thereof, provided that the maximum tolerance shall not exceed 120 mm).

Product specification:

Korea Steel's reinforcing bar is categorized into standard and high-ductility seismic-resistant grades based on its intended applications. In this study, an environmental impact assessment was conducted based on the comprehensive lifecycle production data of the rebar products. The following table presents the material composition and specific characteristics of the rebar products.

Materials	CAS No.	Concentration(%)	
		Min	Max
Fe (Iron)	7439-89-6	98.33	98.80
C (Carbon)	7440-44-0	0.21	0.25
Si (Silicon)	7440-21-3	0.08	0.36
Mn (Manganese)	7439-96-5	0.91	0.97
P (Phosphorus)	7723-14-0	-	0.041
S (Sulfur)	7704-34-9	-	0.04

Table 1 Products components of Reinforcing bar

**Small amounts of other constituents below the concentration limit may be present (e.g., aluminum (Al), copper (Cu), chromium (Cr), molybdenum (Mo), nickel (Ni), vanadium (V), etc.).*

Physical state	Melting point(℃)	Flash point(℃)	Specific gravity
Solid	1535	2750	7.86

Table 2 Specific characterisitcs of the Reinfocing bar

Technical data:

Standard : KS D 3504:2021

Dimension and Tolerance : KS D 3504:2021

Products	Specification
SD400	D10, D13, D16, D19, D22, D25, D29, D32
SD500	D10, D13, D16, D19, D22, D25, D29, D32
SD600	D16, D19, D22, D25,
SD500S	D10, D13, D16, D19, D22, D25
SD600S	D16, D19, D22, D25, D29, D32
A630	D10, D12, D16
GR40	D10, D13, D16
GR60	D10, D13, D16, D19
GR40-A	D10, D13
GR60-A	D10, D13, D16, D19

Designation (mm)	Unit Weight (kg/m)	Norminal Diameter			Transverse rib diameter				
		Diameter (mm)	Cross-sectional area (mm3)	Circumference (mm)	Maxium Value of mean interval Max(mm)	Mean height of transverse rib		Max value of sum of gap(mm)	Angle between axial line(°)
						Min(mm)	Max(mm)		
D10	0.56	9.53	71.33	29.9	6.7	0.4	0.8	7.5	Min. 45
D13	0.995	12.7	126.7	39.9	8.9	0.5	1	10	
D16	1.56	15.9	198.6	50	11.1	0.7	1.4	12.5	
D19	2.25	19.1	286.5	60	13.4	1	2	15	
D22	3.04	22.2	387.1	69.8	15.5	1.1	2.2	17.5	
D25	3.98	25.4	506.7	79.8	17.8	1.3	2.6	20	
D29	5.04	28.6	642.4	89.9	20	1.4	2.8	22.5	
D32	6.23	31.8	794.2	99.9	22.3	1.6	3.2	25	

The Chilseo manufacturing site of Korea Steel Co., Ltd. is certified in accordance with ISO 9001:2015, ISO 45001:2018, and ISO 14001:2015.

All reinforcing bars manufactured at this site are produced in strict compliance with the KS D 3504:2021 standard.

Market:

Korea, USA, Belize, Chile and Puerto Rico

Reference service life, product:

50 years

Reference service life, building:

50 years

LCA: Calculation rules

Declared unit:

1 metric tonne of Reinforcing bar

Cut-off criteria:

All known inputs and outputs were fully considered. All data that could affect product quality were included, without any omissions based on mass, energy, or environmental relevance.

In accordance with PCR guidelines, a 1% cut-off rule based on mass, energy, and environmental relevance was applied per unit process. Minor, non-quality-critical operational inputs—such as routine light bulb replacements and trace maintenance materials—were excluded under this rule. No hazardous or environmentally significant toxic flows were excluded under this cut-off rule.

Allocation:

Co-products were generated during the manufacturing process, and allocation was considered in accordance with EN15804+A2:2019. The hierarchy considered was: 1) allocation avoidance, 2) physical allocation and 3) economic allocation

Physical allocation based on production volume was applied to properly reflect the specific characteristics and material flows of each process. Economic allocation was applied to distribute the environmental impacts among the co-products.

Data quality:

The manufacturing of the reinforcing bars takes place in South Korea. Therefore, wherever possible, a Korean (KR) dataset was selected for secondary (background) data. If no dedicated Korean dataset was available, global (GLO) or rest-of-the-world (RoW) datasets from the Ecoinvent 3.10 database-which has a validity period ending in 2023- were used as the most appropriate approximations.

The data quality for this Life Cycle Assessment (LCA) study was assessed based on geographical, technological, and temporal relevance in accordance with EN 15804:2012+A2:2019 and ISO 14044 standards.

To maintain database consistency and reliability, the highly reliable Ecoinvent 3.10 database was strictly utilized for all upstream processes, energy production, and raw material extraction.

In terms of technological representation, the primary data directly reflects the actual electric arc furnace (EAF) steelmaking and rolling processes utilized at the Korea Steel facility. Since the core process data–including the consumption of raw materials, auxiliary materials, and energy demand–were directly measured and collected at the site, the technological data quality is deemed optimal. Consequently, the data used in this LCA model is considered to be of high quality, reliable, and fully compliant with the stringent data quality requirements specified

in EN 15804:2012+A2:2019 and the relevant PCRs (NPCR Part A and NPCR 013 Part B).

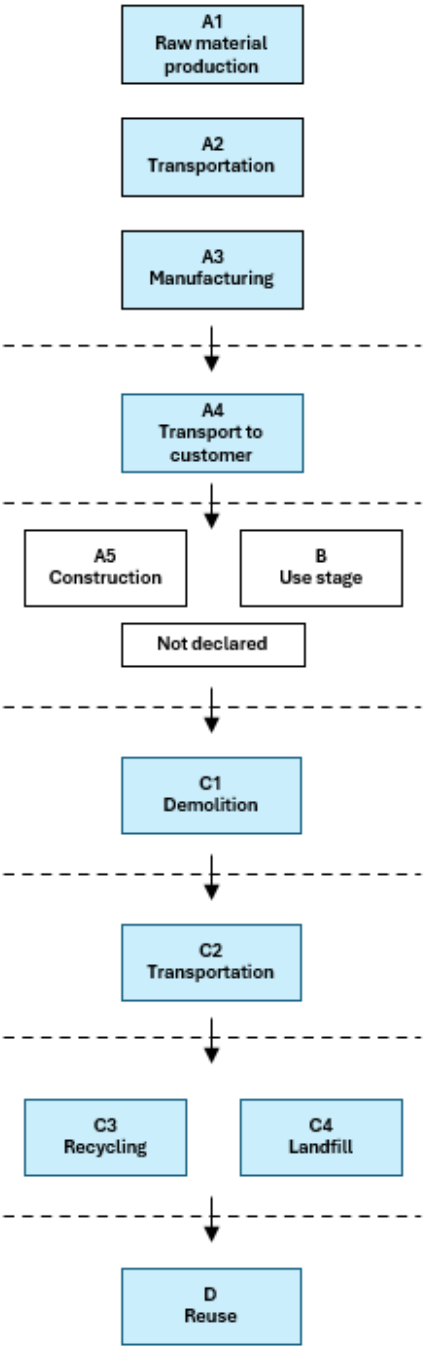
The data used in this LCA model is considered to be of high quality, reliable, and fully compliant with the data quality requirements specified in the relevant PCRs and standards.

System boundaries

Product stage			Assembly stage		Use stage							End of life stage				Benefits & loads beyond system boundary
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X

(X=included, MND=module not declared, MNR=module not relevant)

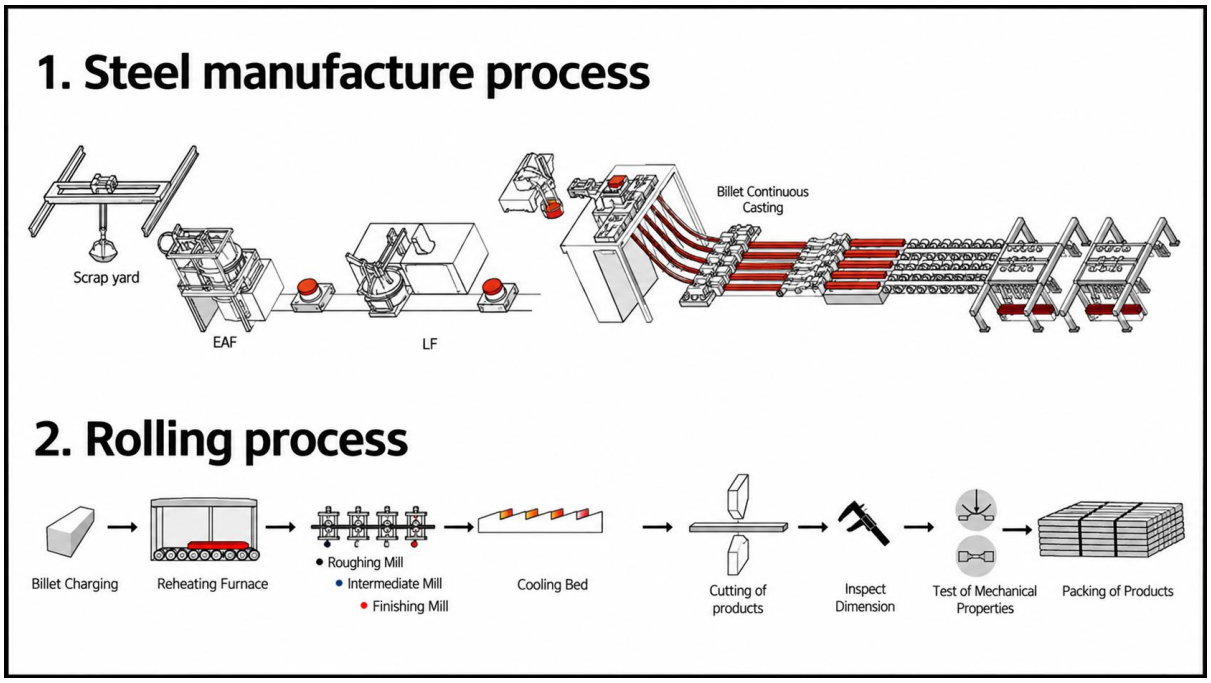
The system boundary of this study is defined on a Cradle-to-Grave basis regarding the materials fed into the product manufacturing process. For the raw and auxiliary materials utilized in the reinforcing bar (rebar) manufacturing process, the inventory scope covers both the product stage (raw material supply and transport; Modules A1-A2) and the manufacturing stage (steelmaking and rolling processes; Module A3). This encompasses primary raw materials such as steel scrap and billets, as well as auxiliary materials and secondary consumables.


A1
Raw material production
A2
Transportation
A3
Manufacturing
A4
Transport to customer
A5
Construction
B
Use stage
Not declared
C1
Demolition
C2
Transportation
C3
Recycling
C4
Landfill
D
Reuse

Technical flow chart

This study adopted the module structure of ISO 14044, ISO 14025, EN 15804 and the relevant PCR as the fundamental basis for establishing the system boundary, encompassing the product stage(A1-A4), end of life stage(C1-C4) and benefits and loads beyond the system boundary(D)

No.	Process	Detail
1	Raw material charging	Intake and charging of raw and auxiliary materials such as steel scrap, manganese, and quicklime into the system.
2	EAF (Electric Arc Furnace)	The melting process where steel scrap is melted by injecting electricity, oxygen, and other energy sources.
3	LF (Ladle Furnace)	The refining process dedicated to homogenizing molten steel and adjusting its chemical composition.
4	CCM (Continuous Casting Machine)	The continuous casting process where molten steel is solidified and cast into intermediate semi-finished products called billets.
5	Cooling	The initial cooling stage where newly cast billets are stabilized and cooled for production.
6	Billet production	The finalization step where semi-finished billets are completed and managed as raw material for rebar.
7	Billet charging	The process of feeding and charging the produced billets into the reheating furnace to prepare for rolling
8	Reheating	Thermal treatment to reheat the billets to the optimal temperature required for the subsequent rolling process.
9	Rolling	The forming process where heated billets pass through multiple rolls to shape them into steel rebars.
10	Cooling	A controlled cooling process designed to increase the mechanical properties and surface hardness of the rolled rebars.
11	Cutting and Inspection	Cutting the rebars to standard length specifications followed by rigorous dimensional and mechanical property inspections.
12	Packaging	The final step of binding the finished rebars into wire bundles and preparing them for shipment.



Data collection

This study adopted the module structure of ISO 14044, ISO 14025, EN 15804 and the relevant PCR as the fundamental basis for establishing the system boundary, encompassing the product stage(A1-A4), end of life stage(C1-C4) and benefits and loads beyond the system boundary(D). The product under evaluation is manufactured exclusively at a single production site (Korea Steel Co., Ltd., Chilseo factory).

The temporal scope of the data collection covers a one- year period from January 2025 to December 2025. Throughout this reference period, data collection criteria for all inputs and outputs were applied with strict consistency. Since the inventory is based entirely on the actual operational data of this single facility, the study ensures high data consistency without any geographical or temporal mismatches.

LCA: Scenarios and additional technical information

The following information describes the scenarios in the different modules of the EPD.

Transport from production place to assembly/user (A4)

Transport from production place to assembly/user (A4)	Capacity utilisation (incl. return) [%]	Distance [km]	Fuel/Energy consumption	Unit	Value
Truck	50	5.30E-05	1.54E-01	ton*km	1.49E-02
Container ship	50	4.31E-03	1.02E-02	ton*km	4.36E+00

The transport scenario assumes full load capacity during delivery with an empty return trip. The corresponding values for fuel and energy consumption were taken directly from the relevant Ecoinvent processes.

End of Life (C1, C3, C4)

	Unit	Value
Recycling	kg	9.50E+02
Landfill	kg	5.00E+01

The deconstruction is assumed to be performed using diesel-operated machinery. Applying a conservative approach, the energy consumption for demolishing steel structures is set equal to that of concrete buildings at 0.036 MJ/kg (0.01 kWh/kg, Bozdag & Seçer, 2007). A reinforced concrete building contains 97% inert material and 3% steel. Therefore, the energy consumption required to demolish 1 metric tonne of reinforcing bar is 1.200E+03 MJ/t (36 MJ/t ÷ 3%). It is assumed that 100% of the demolished waste is collected and transported to a treatment facility, where approximately 95% of the end-of-life steel is recovered for recycling based on World Steel Association (2024) data, while the remaining 5% is sent to landfill for final disposal.

Transport to waste processing facility (C2)

Transport to waste processing facility (C2)	Capacity utilisation (incl. return) [%]	Distance [km]	Fuel/Energy consumption	Unit	Value
Truck(to recycling)	50	30	1.54E-01	ton*km	2.85E+01
Truck(to landfill)	50	30	1.54E-01	ton*km	1.50E+00

The baseline scenario for module C2 waste transport relies on localized regulatory defaults based on national statistics. As prescribed by national construction waste guidelines, a minimum haul distance of 30 km by lorry is assumed from the demolition site to the facility to account for unidentifiable bidding contractors. Related capacity utilization and fuel consumption parameters were derived directly from corresponding Ecoinvent datasets.

Benefits and loads beyond the system boundaries (D)

Benefits and loads beyond the system boundaries (D)	Unit	Value
Substitution of primary steel with net scrap	kg	-4.99E+01

Due to the recycling process, end-of-life products are recovered and converted into secondary steel. Given the high recyclability of steel, the potential environmental benefits and loads resulting from the recovery of steel scrap were evaluated beyond the system boundary (Module D).

Cut-off criteria for initial inclusion of inputs and outputs

High accuracy was achieved using direct measurements from Korea Steel's Chilseo Plant and the Korean electricity grid mix, though global Ecoinvent 3.10 data was applied to certain upstream processes like purchased billets.

In the steel industry, production quantities are generally managed based on theoretical weights in accordance with Korean Industrial Standards (KS), with deviations of approximately ±5% from actual weights considered acceptable in industry practice. Accordingly, material input and product output quantities were maintained without adjustment, and no mass balance corrections were applied.

Indirect processes (R&D, worker facilities) and internal slag recirculation were excluded. Minor items under 1% were cut off pursuant to PCR rules, while all toxic and hazardous materials were fully accounted for.

LCA: Results

The result tables are given using a location based approach for foreground system (A3) More information about transparent reporting of electricity in the additional requirements section.

This life cycle assessment (LCA) was conducted in accordance with the EN 15804+A2 standard and the EF 3.1 (Environmental Footprint 3.1) methods, utilizing the openLCA software and the Ecoinvent 3.10 database for life cycle inventory (LCI) modeling and environmental impact calculation.

Core environmental impact indicators

Indicator	Unit	A1-A3	A4	C1	C2	C3	C4	D
GWP - total	kg CO2 eq	9.17E+02	6.70E+01	1.20E+02	4.62E+00	5.96E+01	5.75E-01	-8.33E+01
GWP - fossil	kg CO2 eq	9.15E+02	6.70E+01	1.20E+02	4.62E+00	5.96E+01	5.70E-01	-8.33E+01
GWP - biogenic	kg CO2 eq	1.77E+00	-1.25E-02	1.31E-02	3.05E-04	6.51E-03	4.70E-03	3.63E-02
GWP - luluc	kg CO2 eq	5.30E-01	3.27E-02	1.04E-02	1.92E-03	5.17E-03	3.21E-04	-1.78E-03
ODP	kg CFC11 eq	8.58E-06	9.81E-07	1.84E-06	7.02E-08	9.12E-07	1.42E-08	-1.89E-13
AP	molc H+ eq	3.70E+00	1.35E+00	1.09E+00	1.11E-02	5.38E-01	6.06E-03	-1.86E-01
EP-freshwater	kg P eq	4.36E-01	3.26E-03	3.51E-03	3.75E-04	1.74E-03	8.76E-04	-1.57E-05
EP -marine	kg N eq	9.61E-01	3.36E-01	5.03E-01	2.64E-03	2.49E-01	1.51E-03	-3.27E-02
EP - terrestrial	molc N eq	9.50E+00	3.73E+00	5.51E+00	2.86E-02	2.73E+00	1.63E-02	-2.87E-01
POCP	kg NMVOC eq	2.89E+00	1.05E+00	1.64E+00	1.58E-02	8.14E-01	5.72E-03	-1.33E-01
ADP-M&M[2]	kg Sb-Eq	2.74E-03	1.18E-04	4.41E-05	1.51E-05	2.19E-05	1.29E-06	-2.15E-04
ADP-fossil[2]	MJ	1.30E+04	8.69E+02	1.57E+03	6.64E+01	7.79E+02	1.24E+01	-7.94E+02
WDP[2]	m^3	2.51E+02	3.01E+00	3.85E+00	3.10E-01	1.91E+00	6.25E-02	-1.04E+03

GWP-total: *Global Warming Potential;* ***GWP-fossil:*** *Global Warming Potential fossil fuels;* ***GWP-biogenic:*** *Global Warming Potential biogenic;* ***GWP-LULUC:*** *Global Warming Potential land use and land use change;* ***ODP:*** *Depletion potential of the stratospheric ozone layer;* ***AP:*** *Acidification potential, Accumulated Exceedance;* ***EP-freshwater:*** *Eutrophication potential, fraction of nutrients reaching freshwater end compartment; See "additional Norwegian requirements" for indicator given as PO4 eq.* ***EP-marine:*** *Eutrophication potential, fraction of nutrients reaching freshwater end compartment;* ***EP-terrestrial:*** *Eutrophication potential, Accumulated Exceedance;* ***POCP****: Formation potential of tropospheric ozone;* ***ADP-M&M****: Abiotic depletion potential for non-fossil resources (minerals and metals);* ***ADP-fossil:*** *Abiotic depletion potential for fossil resources;* ***WDP:*** *Water deprivation potential, deprivation weighted water consumption*

Reading example: 9.0 E-03 = $9.0*10^{-3}$ = $9.0*\frac{1}{10}*\frac{1}{10}*\frac{1}{10}$=0.009 9.0 E+03 = $9.0*10^{3}$ = 9.0*10*10*10=9000

Additional environmental impact indicators

Indicator	Unit	A1-A3	A4	C1	C2	C3	C4	D
PM	Disease incidence	6.31 E-05	3.15 E-06	3.08 E-05	3.74 E-07	1.53 E-05	9.18 E-08	-2.63 E-06
IRP[1]	kBq U235 eq.	1.82 E+02	5.31 E-01	7.05 E-01	5.77 E-02	3.49 E-01	1.11 E-02	1.95 E+03
ETP-fw[2]	CTUe	6.63 E+03	1.79 E+02	2.23 E+02	1.74 E+01	1.10 E+02	1.31 E+01	-4.00 E+01
HTP-c[2]	CTUh	1.30 E-05	3.04 E-07	4.70 E-07	2.39 E-08	2.33 E-07	3.29 E-09	-3.53 E-08
HTP-nc[2]	CTUh	1.55 E-05	3.50 E-07	2.14 E-07	4.27 E-08	1.06 E-07	1.63 E-08	1.18 E-07
SQP[2]	Dimensionless	2.85 E+03	2.88 E+02	1.11 E+02	4.97 E+01	5.48 E+01	2.90 E+01	1.31 E+01

PM: *Particulate matter emissions;* ***IRP:*** *Ionising radiation, human health;* ***ETP-fw:*** *Ecotoxicity (freshwater);* ***ETP-c:*** *Human toxicity, cancer effects;* ***HTP-nc:*** *Human toxicity, non-cancer effects;* ***SQP:*** *Land use related impacts / soil quality*

[1] This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

[2] The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator

Resource use

Parameter	Unit	A1-A3	A4	C1	C2	C3	C4	D
PERE	MJ	5.16E+02	7.19E+00	8.60E+00	7.68E-01	4.26E+00	1.46E-01	5.01E+01
PERM	MJ	7.94E+01	1.30E+00	1.05E+00	1.39E-01	5.21E-01	2.87E-02	-3.15E-02
PERT	MJ	5.95E+02	8.50E+00	9.65E+00	9.07E-01	4.78E+00	1.75E-01	5.00E+01
PENRE	MJ	1.26E+04	7.86E+02	1.42E+03	6.03E+01	7.03E+02	1.13E+01	-8.41E+02
PENRM	MJ	3.73E+02	8.35E+01	1.55E+02	6.12E+00	7.69E+01	1.15E+00	0.00E+00
PENRT	MJ	1.30E+04	8.70E+02	1.57E+03	6.64E+01	7.79E+02	1.24E+01	-8.41E+02
SM	kg	1.08E+03	6.04E-01	9.30E-01	5.06E-02	4.61E-01	9.43E-03	0.00E+00
RSF	MJ	1.43E+01	6.86E-02	1.10E-01	6.66E-03	5.45E-02	1.39E-03	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	3.13E+00	8.18E-02	1.02E-01	9.25E-03	5.07E-02	-1.85E-01	-3.63E-01

PERE *Renewable primary energy resources used as energy carrier;* ***PERM*** *Renewable primary energy resources used as raw materials;* ***PERT*** *Total use of renewable primary energy resources;* ***PENRE*** *Nonrenewable primary energy resources used as energy carrier;* ***PENRM*** *Nonrenewable primary energy resources used as materials;* ***PENRT*** *Total use of non-renewable primary energy resources;* ***SM*** *Use of secondary materials;* ***RSF*** *Use of renewable secondary fuels;* ***NRSF*** *Use of non-renewable secondary fuels;* ***FW*** *Use of net fresh water.*

End of life – Waste

Parameter	Unit	A1-A3	A4	C1	C2	C3	C4	D
HWD	kg	9.21E+01	9.60E-01	1.36E+00	7.98E-02	6.75E-01	1.83E-02	0.00E+00
NHWD	kg	1.96E+03	7.16E+00	1.02E+01	6.22E-01	5.06E+00	2.49E+02	0.00E+00
RWD	kg	4.63E-02	1.30E-04	1.73E-04	1.41E-05	8.57E-05	2.70E-06	0.00E+00

HWD *Hazardous waste disposed;* ***NHWD*** *Non-hazardous waste disposed;* ***RWD*** *Radioactive waste disposed.*

End of life – output flow

Parameter	Unit	A1-A3	A4	C1	C2	C3	C4	D
CRU	kg	9.12E-17	-4.47E-18	-8.58E-18	-2.73E-19	-4.25E-18	-5.06E-20	0.00E+00
MFR	kg	3.18E+01	5.66E-01	7.68E-01	4.31E-02	3.80E-01	6.29E-03	0.00E+00
MER	kg	6.42E-03	3.08E-05	4.94E-05	2.99E-06	2.45E-05	6.27E-07	0.00E+00
EEE	MJ	1.82E+00	4.95E-02	7.02E-02	5.03E-03	3.48E-02	3.48E-03	0.00E+00
EET	MJ	9.39E-01	5.56E-02	3.72E-02	7.79E-03	1.85E-02	1.36E-03	0.00E+00

CRU *Components for reuse;* ***MFR*** *Materials for recycling;* ***MER*** *Materials for energy recovery;* ***EEE*** *Exported electric energy;* ***EET*** *Exported thermal energy.*

Information describing the biogenic carbon content at the factory gate

Biogenic carbon content	Unit	Value
Biogenic carbon content in product	kg C	0.00E+00
Biogenic carbon content in the accompanying packaging	kg C	0.00E+00

Note: 1 kg biogenic carbon is equivalent to 44/12 (approx. 3.67) kg CO_2

Since the product is a reinforcing bar manufactured via electric arc furnace (EAF) steelmaking, it contains no organic or bio-based materials. Although a trace amount of carbon (around 0.25%) is present as an alloying element in the steel matrix, this carbon is non-biogenic. Therefore, the biogenic carbon content of the declared product is reported as 0 kg C.

Assumptions and limitations associated with the interpretation

The life cycle assessment (LCA) results presented in this report should be interpreted with a clear understanding of the underlying methodological assumptions and data limitations described below:

While the primary foreground data collected directly from the Korea Steel plant ensures high accuracy for the core manufacturing stage (Module A3), certain background data for upstream processes relies on the Ecoinvent 3.10 database using Global (GLO) or Rest of World (RoW) averages. Although the South Korean electricity grid mix (KR) was accurately applied to the production facility, the utilization of global averages for specific upstream raw and auxiliary materials (such as purchased billets) introduces minor geographical representativeness limitations.

Due to the technical characteristics of the rebar manufacturing process, maintaining a precise mass balance poses practical limitations. In the steel industry, production and sales volumes are primarily managed based on theoretical weights (compliant with KS standards) rather than actual measured weights. An error margin of approximately 5% is standard and generally accepted in the market as equivalent in mass.

Internal scrap generated during production is managed through accurate weighing systems. The total input of iron scrap has been adjusted to account for this specific in-house re-circulation.

A few minor items, such as extremely small quantities of maintenance consumables, were excluded from the modeling based on the 1% cut-off rule, as their expected environmental impacts are negligible.

Additional requirements

Transparent reporting of energy

The EPD provides in the main result tables environmental impact categories based on a *location based approach*. The information below is provided so EPD users are able to understand the effect of these methodological choices.

The table below shows calculation of GWP-total for energy resources used in the manufacturing process for each approach.

Energy source	Data source	Geography	Amount*	Unit	GWP_{total} [kg CO_2 -eq/unit]	SUM [kg CO_2 -eq]
Location based approach						
market for electricity, high voltage	Ecoinvent v3.10	KR	6.54E+02	kWh	6.50E-01	4.25E+02
market for natural gas, liquefied	Ecoinvent v3.10	GLO	1.17E+01	m3	6.19E-01	7.23E+00
liquefied petroleum gas production, petroleum refinery operation	Ecoinvent v3.10	RoW	2.42E-02	kg	9.78E-01	2.37E-02

Additional environmental impact indicators required for construction products

In order to increase the transparency of biogenic carbon contribution to climate impact, the indicator GWP-IOBC is required as it declares climate impacts calculated according to the principle of instantaneous oxidation. GWP-IOBC is also referred to as GWP-GHG in context to Swedish public procurement legislation.

Parameter	Unit	A1-A3	A4	C1	C2	C3	C4	D
GWP-IOBC	kg CO_2-eq.	9.16E+02	6.71 E+01	1.20 E+02	4.62 E+00	5.96 E+01	5.74 E-01	-8.33 E+01

GWP-IOBC *Global warming potential calculated according to the principle of instantaneous oxidation.*

Hazardous substances

The declaration is based upon reference to threshold values and/or test results and/or material safety data sheets provided to EPD verifiers. Documentation available upon request to EPD owner.

- ■ The product contains no substances given by the REACH Candidate list.
- □ The product contains substances given by the REACH Candidate list that are less than 0,1 % by weight.
- □ The product contains dangerous substances, more then 0,1% by weight, given by the REACH Candidate List, see table.
- □ The product contains no substances given by the REACH Candidate list.
- □ The product is classified as hazardous waste, see table.

Indoor environment

No tests have been carried out on the product concerning indoor climate - not relevant

Carbon footprint

While a carbon footprint analysis has not been conducted for the product separately, the results section does include an evaluation of Global Warming Potential (GWP) with such an analysis. The GWP total results presented in this EPD document represents the carbon footprint of the product studied

Bibliography

ISO 14025:2010	Environmental labels and declarations - Type III environmental declarations - Principles and procedures
ISO 14044:2006	Environmental management - Life cycle assessment - Requirements and guidelines
EN 15804:2012+A2:2019	Sustainability of construction works - Environmental product declaration - Core rules for the product category of construction products
ISO 21930:2017	Sustainability in building construction - Environmental declaration of building products
NPCR Part A	Construction products and services (Version 2.0, Issue data 24.03. 2021)
NPCR 013 Part B	For steel and Aluminum Construction Products (Version 4.0, Issu data: 06.10.2021, validity extended to 30.06.2026)
Ecoinvent	Swiss Centre for Life Cycle Assessment, v3.10, 2023

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